Office for Interoperability and Compatibility

Project 25 Compliance Assessment Bulletin

Project 25

Compliance Assessment Program

Baseline Common Air Interface Testing Requirements

P25-CAB-CAI_TEST_REQ

September 2009

Notice of Disclaimer and Limitation of Liability

The Project 25 Compliance Assessment Program (P25 CAP) provides equipment purchasers demonstrated evidence of a product's compliance with a select group of requirements within the suite of P25 standards. The test procedures used to validate these requirements are also part of the P25 suite of standards. While successful tests will demonstrate P25 compliance for the specific requirements tested, the conclusions drawn from these tests do not apply to every environment or need that individual users may have. P25-CAP-mandated tests only demonstrate product compliance with the test procedures listed in the Supplier's Declaration of Compliance and, therefore, only attest to a product's compliance with specific requirements within the P25 standard.

Revision History

Version	Date	Description
First draft	April 29, 2008	Draft released for review.
Release	July 1, 2008	Final release version approved on June 25, 2008, P25 CAP Governing Board meeting.
Draft	August 1, 2008	Draft version modifying the rule of three and adding the Exceptions section.
Release	August 18, 2008	Final release version approved on August 14, 2008, P25 CAP Governing Board meeting.
Draft	December 16, 2008	Draft version modifying this Compliance Assessment Bulletin to specifically cover the Project 25 Common Air Interface.
Release	February 4, 2009	Final release version approved on February 4, 2009, P25 CAP Governing Board meeting.
Release	September, 8, 09	Added test substitution exception for trunked interoperability.

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1 Introduction

The Project 25 Compliance Assessment Program (P25 CAP) is a voluntary program that allows P25 equipment suppliers to formally demonstrate their products' compliance with a select group of requirements within the suite of P25 standards. The purpose of the Program is to provide emergency response agencies with evidence that the communications equipment they are purchasing meets P25 standards for performance, conformance, and interoperability.

The Program requires test laboratories to demonstrate their competence through a rigorous and objective assessment process. Such a process promotes the user community's confidence in, and acceptance of, test results from recognized laboratories. All equipment suppliers that participate in the P25 CAP must use DHS-recognized laboratories to conduct performance, conformance, and interoperability tests on their products. P25 equipment suppliers will release summary test reports and declarations of compliance based on testing from laboratories recognized by the Department of Homeland Security. This documentation will serve to increase the public's confidence in the performance, conformance, and interoperability of P25 equipment.

Performance, conformance, and interoperability issues are likely to occur in all communications technologies and especially in ones such as P25 where protocols constantly adapt to changing user requirements. Such problems should be resolved within the P25 CAP and, notably, before product launch and deployment. Further, the declaration of compliance-related documents developed by Program participants will provide useful technical information about the equipment.

The P25 CAP will provide the more than 60,000 emergency response agencies nationwide with a consistent and tractable perspective of P25 product compliance. It will also provide a means of verifying that Federal grant dollars are being invested in standardized solutions and equipment that promote interoperability.

1.1 Scope

The FY 2007 SAFECOM *Recommended Federal Grant Guidance* states that grant applicants using funds to purchase P25 equipment must obtain certain documented evidence from the manufacturer. The evidence should show that the equipment has been tested and passed all of the applicable, published, and normative P25 compliance assessment test procedures for performance, conformance, and interoperability. This document defines these procedures for the P25 Common Air Interface (CAI). Applicable test procedures include tests of all mandatory features and standard options installed in the product contemplated for purchase[1].

[1] Most radio technologies require climatic and power supply voltage nominal as well as extreme testing. The present P25 Compliance Assessment Program is for nominal conditions only. If extreme testing is required, then this should be stipulated and made mandatory in the contract for purchase of the devices or system. The measurement report and data should be reviewed by the procuring agency to determine if the extreme climatic and/or power supply voltages have been tested.

1.2 Normative References

[1] ANSI/TIA-102.CAAA-B, Digital C4FM/CQPSK Transceiver Measurement Methods
[2] ANSI/TIA-102.CAAB-B, Land Mobile Radio Transceiver Performance Recommendations – Project 25 – Digital Radio Technology, C4FM/CQPSK Modulation
[3] ANSI/TIA-102.CABC-A, Interoperability Testing for Voice Operation in Trunked Systems

1.3 Informative References

[1] TSB-102.CBBJ, Project 25 Compliance Assessment Program Definition of Compliance – Trunking Interoperability
[2] TSB-102.CBBH, Project 25 Compliance Assessment Program Definition of Compliance – Trunking Mode Fixed Station Transceiver and Related Infrastructure Performance
[3] TSB-102.CBBF, Project 25 Compliance Assessment Program Definition of Compliance – Trunking Mode Subscriber Unit Transceiver Performance
[4] TSB-102.CBBC, Project 25 Compliance Assessment Program Definition of Compliance – Conventional Mode Fixed Station Transceiver Performance
[5] TSB-102.CBBA, Project 25 Compliance Assessment Program Definition of Compliance – Conventional Mode Subscriber Unit Transceiver Performance

2 Baseline Common Air Interface Compliance Assessment Requirements

2.1 Subscriber Units (Phase 1)

If a subscriber unit can operate in both a conventional mode of operation as well as a trunked mode of operation, and if required tests for both are the same, the laboratory performing the tests will only be required to perform the duplicative test once.

2.1.1 Performance

Subscriber units (SUs) shall be tested in accordance with the following sections of ANSI/TIA-102.CAAA-B [1] and shall meet or exceed all of the corresponding minimal performance recommendations (or Class B requirements, where applicable) as specified in ANSI/TIA-CAAB-B [2].

2.1.1.1 Conventional Mode Operation

Table 1. Conventional Mode Subscriber Unit Receiver Tests

Subscriber Unit Receiver Tests	Method of Measurement [1]	Performance Recommendation [2]
Reference Sensitivity	§2.1.4	§3.1.4
Faded Reference Sensitivity	§2.1.5	§3.1.5
Signal Delay Spread Capability	§2.1.6	§3.1.6
Adjacent Channel Rejection	§2.1.7	§3.1.7
Co-Channel Rejection	§2.1.8	§3.1.8
Spurious Response Rejection	§2.1.9	§3.1.9
Intermodulation Rejection	§2.1.10	§3.1.10
Signal Displacement Bandwidth	§2.1.11	§3.1.11
Late Entry Unsquelch Delay	§2.1.17	§3.1.17
Receiver Throughput Delay	§2.1.18	§3.1.18

Table 2. Conventional Mode Subscriber Unit Transmitter Tests

Subscriber Unit Transmitter Tests	Method of Measurement [1]	Performance Recommendation [2]
Unwanted Emissions: Adjacent Channel Power Ratio	§2.2.8	§3.2.8
Transmitter Power and Encoder Attack Time	§2.2.12	§3.2.12
Transmitter Throughput Delay	§2.2.14	§3.2.14
Frequency Deviation for C4FM	§2.2.15	§3.2.15
Modulation Fidelity	§2.2.16	§3.2.16
Transient Frequency Behavior	§2.2.18	§3.2.18

2.1.1.2 Trunked Mode Operation

Table 3. Trunking Mode Subscriber Unit Receiver Tests

Subscriber Unit Receiver Tests	Method of Measurement [1]	Performance Recommendation [2]
Reference Sensitivity	§2.1.4	§3.1.4
Faded Reference Sensitivity	§2.1.5	§3.1.5
Signal Delay Spread Capability	§2.1.6	§3.1.6
Adjacent Channel Rejection	§2.1.7	§3.1.7
Co-Channel Rejection	§2.1.8	§3.1.8
Spurious Response Rejection	§2.1.9	§3.1.9
Intermodulation Rejection	§2.1.10	§3.1.10
Signal Displacement Bandwidth	§2.1.11	§3.1.11

Table 4. Trunking Mode Subscriber Unit Transmitter Tests

Subscriber Unit Transmitter Tests	Method of Measurement [1]	Performance Recommendation [2]
Unwanted Emissions: Adjacent Channel Power Ratio	§2.2.8	§3.2.8
Transmitter Power and Encoder Attack Time	§2.2.12	§3.2.12
Transmitter Throughput Delay	§2.2.14	§3.2.14
Frequency Deviation for C4FM	§2.2.15	§3.2.15
Modulation Fidelity	§2.2.16	§3.2.16
Transient Frequency Behavior	§2.2.18	§3.2.18

Table 5. Trunking Mode Subscriber Unit Tests

Trunking Subscriber Unit Tests	Method of Measurement [1]	Performance Recommendation [2]
Trunking Control Channel Slot Times	§2.3.1	§3.3.1
Trunking Request Time[2]	§2.3.2	§3.3.2
Trunking Voice Access Time[2]	§2.3.3	§3.3.3

[2] Applies to the infrastructure and subscriber unit, and the measurement method necessitates both trunking and infrastructure and subscriber equipment.

Transmitter Time to Key on a Traffic Channel[2]	§2.3.5	§3.3.5

2.1.2 Conformance

2.1.2.1 Basic Conventional Mode Operation

No tests are defined or required at this time.

2.1.2.2 Advanced Conventional Mode Operation

No tests are defined or required at this time.

2.1.2.3 Basic Trunked Mode Operation

No tests are defined or required at this time.

2.1.2.4 Advanced Trunked Mode Operation

No tests are defined or required at this time.

2.1.3 Interoperability

2.1.3.1 Conventional Mode Operation

No tests are defined or required at this time.

2.1.3.2 Trunked Mode Operation

P25 SUs capable of trunked mode operation shall be tested for interoperability in accordance with ANSI/TIA-102.CABC-A [3]. SUs must be tested against at least three of the commercially available, band-compatible trunked systems.

Table 6 Trunking Interoperability Tests

Trunking Interoperability Tests	Normative Test [1]
Full Registration	**§2.2.1**
Valid Registration	§2.2.1.4.1
Denied or Refused Registration	§2.2.1.4.2
Unverified Registration	§2.2.1.4.3
Group Voice Call	**§2.2.2**
Group Call Granted	§2.2.2.4.1
Group Call Denied	§2.2.2.4.2
Group Call Request Queued	§2.2.2.4.3
Unit-to-Unit Voice Call	**§2.2.3**
Unit-to-Unit Call with Target Availability Check[3]	§2.2.3.4.1
Unit-to-Unit Call with Target Availability Check Denied by Target[3]	§2.2.3.4.2
Unit-to-Unit Call Queued with Target Availability Check[3]	§2.2.3.4.3
Unit-to-Unit Call without Target Availability Check[3]	§2.2.3.4.4
Unit-to-Unit Call Queued without Target Availability Check[3]	§2.2.3.4.5
Unit-to-Unit Call Denied	§2.2.3.4.6
Broadcast Voice Call	**§2.2.4**
Broadcast Voice Call	§2.2.4.4.1

[3] The fixed network equipment may support a target availability check, no target availability check, or both.

Trunking Interoperability Tests	Normative Test [1]
Affiliation	**§2.2.5**
Radio Permitted to Affiliate with New Group	§2.2.5.4.1
Radio Denied Affiliation to New Group	§2.2.5.4.2
Announcement Group Call	**§2.2.6**
Collection of Talk Groups Receive Call[4]	§2.2.6.4.1
Emergency Alarm	**§2.2.7**
Emergency Alarm[4]	§2.2.7.4.1
Emergency Group Call	**§2.2.8**
Emergency Call[4]	§2.2.8.4.1
Encryption	**§2.2.10**
Call Privacy for Encrypted Call[4]	§2.2.10.4.1
Intra-Location Registration Area Roaming	**§2.2.11**
Idle Radio	§2.2.11.4.1

2.2 Base Stations/Repeaters (Phase 1)

If a base station/repeater can operate in both a conventional mode of operation as well as a trunked mode of operation, and if required tests for both are the same, the laboratory performing the tests will only be required to perform the duplicative test once.

2.2.1 Performance

Base station radios and repeater units shall be tested in accordance with the following sections of ANSI/TIA-102.CAAA-B [1], and shall meet or exceed all of the corresponding minimal performance recommendations (or Class B requirements, where applicable) as specified in ANSI/TIA-102.CAAB-B [2].

2.2.1.1 Conventional Mode Operation

Table 7. Conventional Mode Fixed Station Receiver Tests

Conventional Station Receiver Tests	Method of Measurement [1]	Performance Recommendation [2]
Reference Sensitivity	§2.1.4	§3.1.4
Faded Reference Sensitivity	§2.1.5	§3.1.5
Adjacent Channel Rejection	§2.1.7	§3.1.7
Co-Channel Rejection	§2.1.8	§3.1.8
Spurious Response Rejection	§2.1.9	§3.1.9
Intermodulation Rejection	§2.1.10	§3.1.10
Signal Displacement Bandwidth	§2.1.11	§3.1.11
Late Entry Unsquelch Delay[5]	§2.1.17	§3.1.17
Receiver Throughput Delay[5]	§2.1.18	§3.1.18

[4] If provided by the manufacturer.
[5] These tests apply to fixed stations which provide an audio (analog) output.

Table 8. Conventional Mode Fixed Station Transmitter Tests

Conventional Station Transmitter Tests	Method of Measurement [1]	Performance Recommendation [2]
Unwanted Emissions: Adjacent Channel Power Ratio	§2.2.8	§3.2.8
Transmitter Throughput Delay[6]	§2.2.14	§3.2.14
Frequency Deviation for C4FM	§2.2.15	§3.2.15
Modulation Fidelity	§2.2.16	§3.2.16
Transient Frequency Behavior	§2.2.18	§3.2.18

2.2.1.2 Trunked Mode Operation

Table 9. Trunked Mode Fixed Station Receiver Tests

Trunking Station Receiver Tests	Method of Measurement [1]	Performance Recommendation [2]
Reference Sensitivity	§2.1.4	§3.1.4
Faded Reference Sensitivity	§2.1.5	§3.1.5
Adjacent Channel Rejection	§2.1.7	§3.1.7
Co-Channel Rejection	§2.1.8	§3.1.8
Spurious Response Rejection	§2.1.9	§3.1.9
Intermodulation Rejection	§2.1.10	§3.1.10
Signal Displacement Bandwidth	§2.1.11	§3.1.11

Table 10. Trunked Mode Fixed Station Transmitter Tests

Trunked Station Transmitter Tests	Method of Measurement [1]	Performance Recommendation [2]
Unwanted Emissions: Adjacent Channel Power Ratio	§2.2.8	§3.2.8
Transmitter Throughput Delay[6]	§2.2.14	§3.2.14
Frequency Deviation for C4FM	§2.2.15	§3.2.15
Modulation Fidelity	§2.2.16	§3.2.16
Transient Frequency Behavior	§2.2.18	§3.2.18

Table 11. Trunked Mode Infrastructure Tests

Trunking Infrastructure Tests	Method of Measurement [1]	Performance Recommendation [2]
Trunking Voice Access Time[7]	§2.3.3	§3.3.3
Time to Grant[7]	§2.3.4	§3.3.4

2.2.2 Conformance

2.2.2.1 Basic Conventional Mode Operation

No tests are defined or required at this time.

[6] These tests apply to fixed stations which provide an audio (analog) input.

[7] These tests apply to infrastructure and subscriber units, and the measurement method necessitates both trunking infrastructure and subscriber equipment.

2.2.2.2 Advanced Conventional Mode Operation

No tests are defined or required at this time.

2.2.2.3 Basic Trunked Mode Operation

No tests are defined or required at this time.

2.2.2.4 Advanced Trunked Mode Operation

No tests are defined or required at this time.

2.2.3 Interoperability

2.2.3.1 Conventional Mode Operation

No tests are defined or required at this time.

2.2.3.2 Trunked Mode Operation

P25 trunked infrastructure shall be tested for interoperability in accordance with ANSI/TIA-102.CABC-A [3]. Trunked infrastructure must be tested against at least three of the commercially available, band-compatible SUs, where each SU is from a different manufacturer. SUs that are in the same model class shall count as one compatible test subject. A model class is defined by the manufacturer as a product having identical P25 functionality; for instance, a radio model with three keypad configurations would count as one test subject.

Table 12. Trunking Interoperability Tests

Trunking Interoperability Tests	Normative Test [1]
Full Registration	**§2.2.1**
Valid Registration	§2.2.1.4.1
Denied or Refused Registration	§2.2.1.4.2
Unverified Registration	§2.2.1.4.3
Group Voice Call	**§2.2.2**
Group Call Granted	§2.2.2.4.1
Group Call Denied	§2.2.2.4.2
Group Call Request Queued	§2.2.2.4.3
Unit-to-Unit Voice Call	**§2.2.3**
Unit-to-Unit Call with Target Availability Check[8]	§2.2.3.4.1
Unit-to-Unit Call with Target Availability Check Denied by Target[8]	§2.2.3.4.2
Unit-to-Unit Call Queued with Target Availability Check[8]	§2.2.3.4.3
Unit-to-Unit Call without Target Availability Check[8]	§2.2.3.4.4
Unit-to-Unit Call Queued without Target Availability Check[8]	§2.2.3.4.5
Unit-to-Unit Call Denied	§2.2.3.4.6
Broadcast Voice Call	**§2.2.4**
Broadcast Voice Call	§2.2.4.4.1
Affiliation	**§2.2.5**
Radio Permitted to Affiliate with New Group	§2.2.5.4.1
Radio Denied Affiliation to New Group	§2.2.5.4.2

[8] The fixed network equipment may support a target availability check, no target availability check, or both.

Trunking Interoperability Tests	Normative Test [1]
Announcement Group Call	**§2.2.6**
Collection of Talk Groups Receive Call[9]	§2.2.6.4.1
Emergency Alarm	**§2.2.7**
Emergency Alarm[9]	§2.2.7.4.1
Emergency Group Call	**§2.2.8**
Emergency Call[9]	§2.2.8.4.1
Encryption	**§2.2.10**
Call Privacy for Encrypted Call[9]	§2.2.10.4.1
Intra-Location Registration Area Roaming	**§2.2.11**
Idle Radio	§2.2.11.4.1

3 Reference of Baseline Common Air Interface Compliance Assessment Tests

In order to provide further clarity regarding the tests that will be performed based on this Compliance Assessment Bulletin, it is important that both public safety and industry refer to the tests in a common fashion. To facilitate this commonality, the following table is provided as the means by which a particular set of tests will be referred to:

Table 13. Reference for P25 Baseline Common Air Interface Tests

Section	Reference
2.1.1.1	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.1.1.1 – Project 25 Phase 1 Common Air Interface Conventional Subscriber Unit Performance
2.1.1.2	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.1.1.2 – Project 25 Phase 1 Common Air Interface Trunked Subscriber Unit Performance
2.1.2.1	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.1.2.1 – Project 25 Phase 1 Common Air Interface Basic Conventional Subscriber Unit Conformance
2.1.2.2	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.1.2.2 – Project 25 Phase 1 Common Air Interface Advanced Conventional Subscriber Unit Conformance
2.1.2.3	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.1.2.3 – Project 25 Phase 1 Common Air Interface Basic Trunked Subscriber Unit Conformance
2.1.2.4	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.1.2.4 – Project 25 Phase 1 Common Air Interface Advanced Trunked Subscriber Unit Conformance
2.1.3.1	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.1.3.1 – Project 25 Phase 1 Common Air Interface Conventional Subscriber Unit Interoperability

[9] If provided by the manufacturer.

Section	Reference
2.1.3.2	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.1.3.2 – Project 25 Phase 1 Common Air Interface Trunked Subscriber Unit Interoperability
2.2.1.1	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.2.1.1 – Project 25 Phase 1 Common Air Interface Conventional Base Station/Repeater Performance
2.2.1.2	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.2.1.2 – Project 25 Phase 1 Common Air Interface Trunked Base Station/Repeater Performance
2.2.2.1	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.2.2.1 – Project 25 Phase 1 Common Air Interface Basic Conventional Base Station/Repeater Conformance
2.2.2.2	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.2.2.2 – Project 25 Phase 1 Common Air Interface Advanced Conventional Base Station/Repeater Conformance
2.2.2.3	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.2.2.3 – Project 25 Phase 1 Common Air Interface Basic Trunked Base Station/Repeater Conformance
2.2.2.4	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.2.2.4 – Project 25 Phase 1 Common Air Interface Advanced Trunked Base Station/Repeater Conformance
2.2.3.1	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.2.3.1 – Project 25 Phase 1 Common Air Interface Conventional Base Station/Repeater Interoperability
2.2.3.2	P25-CAB-CAI_TEST_REQ – September 2009, Section 2.2.3.2 – Project 25 Phase 1 Common Air Interface Trunked Base Station/Repeater Interoperability

4 Exceptions

The preceding sections provide the tests that are required as part of the P25 CAP. Exceptions to these test requirements are possible, on a case-by-case basis, at the discretion of the P25 CAP Governing Board. Exceptions will be noted, by date, test, and—as appropriate—duration in this section of the Compliance Assessment Bulletin.

Table 14. P25 CAP CAI Exceptions

Exception	Date	Details
1	September 2009	The Project 25 Steering Committee has adopted an interim set of tests meant to revise Section 2.2.3 of ANSI/TIA-102.CABC-A while an update to this test standard, ANSI/TIA-102.CABC-B, is moving through the review and publication process within TIA/P25. These revised tests will be allowed as a substitute for the tests described in ANSI/TIA-102.CABC-A Section 2.2.3, as determined appropriate by the manufacturer of the product, until such time as ANSI/TIA-102.CABC-B is formally approved and published.

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